

## CLAIMS

### What is claimed is:

1           1.       A circuit for providing current to a plurality of LEDs, the circuit comprising:  
2                   a plurality of current regulators, each current regulator operable to control current  
3           in a respective one of the LEDs;  
4                   a charge pump terminal operable to supply current to the plurality of LEDs;  
5                   a voltage regulator operable to supply energy to the charge pump; and  
6                   a detector operable to detect occurrence of a condition selected from a list  
7           consisting of current starvation and incipient current starvation at any of the current  
8           regulators;

9                   wherein the voltage regulator has an output that is responsive to detection of the  
10          condition of current starvation.

1           2.       The circuit of claim 1 wherein the charge pump has at least two operating modes,  
2           each operating mode having a respective voltage gain, and wherein one of the at least two  
3           operating modes is selected in response to detection of the condition.

1           3.       The circuit of claim 1 wherein the detector comprises a wired-OR circuit  
2           arrangement.

1           4.       The circuit of claim 1 wherein the detector comprises bipolar diodes and the  
2           plurality of current regulators comprises field effect transistors.

1           5.       The circuit of claim 4 wherein the detector receives a bandgap reference voltage  
2           and further comprises a temperature compensating diode and a comparator.

1           6.       The circuit of claim 2 further comprising a mode latch operable to control  
2           selection of an active operating mode from the at least two operating modes.

7.       The circuit of claim 6 wherein the charge pump has at least three operating  
modes.

1           8.       The circuit of claim 1 wherein the current regulators carry independently differing  
2           currents.

1           9.       A circuit for providing current to a plurality of LEDs, the circuit comprising:  
2                   means for regulating current in each of the LEDs;  
3                   means for supplying current to the plurality of LEDs;

4 means for regulating the means for supplying current; and  
5 means for detecting occurrence of a condition selected from a list consisting of  
6 current starvation and incipient current starvation at the means for regulating current;  
7 wherein the regulating is responsive to the detecting.

1 10. The circuit of claim 9 wherein the means for regulating comprises a charge pump,  
2 the charge pump having multiple modes, each mode having a respective voltage gain.

1 11. The circuit of claim 9 wherein the means for regulating comprises a linear voltage  
2 regulator.

1 12. The circuit of claim 9 wherein the means for detecting comprises a wired-OR of  
2 bipolar diodes and the means for limiting current comprises a field effect transistor.

1 13. A method for providing current to a plurality of LEDs comprising:  
2 regulating current in each of the LEDs to not exceed a desired amount;  
3 detecting a condition selected from a list consisting of current starvation and  
4 incipient current starvation in any of the LEDs; and  
5 regulating a voltage supplied to the plurality of LEDs in response to the detecting  
6 so that the current starvation is abated.

1 14. The method of claim 13 wherein the regulating of a voltage is performed using a  
2 multi-mode charge pump.

1 15. The method of claim 14 wherein the regulating of a voltage is further performed  
2 using a linear voltage regulator.